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REMARKS

Claims 1-7 are pending and await action on the merits. The amendment to claims 1 and 6 have been made to improve clarity. No new matter has been added by way of the above-amendment.

The following rejections made by the Examiner in the parent case 08/110,836 (filed August 23, 1993), have been affirmed by the Board of Appeals in a decision dated November 29, 2001: (1) claims 1-7 are rejected under 35 U.S.C. §103(a) as being unpatentable over Koch taken with Exxon, Gessler and optionally Hous; and (2) claims 1-7 are rejected under 35 U.S.C. §103(a) as being unpatentable over Koch taken with Berta '686 and Berta '302. Applicants respectfully traverse each of the rejections, and firmly believe that the above-amendments to the claims taken in combination with the enclosed Declaration Under 37 C.F.R. §1.132 by Takafumi Taguchi (hereinafter Taguchi III Declaration), inventive claims 1-7 are patentable over the cited references.

With respect to rejection (1), i.e., the 103(a) rejection of claims 1-7 over Koch taken with Exxon, Gessler and, optionally, Hous, the Board discusses the claim language "consisting essentially of" at page 3, line 13 to page 5, last line of the Appeal Decision, and concludes as follows:

We have carefully reviewed the record and based thereon find ourselves in agreement with the supported position advanced by the Examiner (answer, page 5-11; see also

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pages 3-4) that, *prima facie*, one of ordinary skill in this art would have found in the combined teachings of Koch, Exxon, Gessler and Hous the reasonable suggestion that the composition of Koch Example II for the inner liner layer can be modified by using bromobutyl rubber and butyl rubber, and that the composition of Koch Example I for the intermediate rubber layer can be compounded with a sulfenamide as the vulcanization "accelerator" and the same or similar amount of sulfur, with the reasonable expectation of obtaining a pneumatic tire which would have the properties taught by the combination of references, thus arriving at the claimed pneumatic tire encompassed by appealed claims 1 and 6, as we have interpreted these claims above.

The Board further provides additional comments for emphasis at page 6 ff. of the Appeal Decision. The Board states at page 6, first paragraph that Koch teaches that an improved vulcanization bond can be obtained between the rubber layers that contain SBR copolymer (GRS polymer) and that contain butyl rubber and a diene rubber, by controlling the allocation of sulfur during vulcanization by adding silica to the SBR copolymer and chlorinating the butyl rubber. The Board further states in the paragraph bridging pages 6 and 7 that the ingredients of each of the inner liner and intermediate rubber layer compositions disclosed by Koch are encompassed by the corresponding claimed layer even if not specifically listed in claims 1 and 6. In particular, the Board states that the natural rubber in the inner liner composition of Koch Example II and other diene rubbers are not excluded from the rubber component of the claimed inner liner

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composition by the transitional term "consisting essentially of", and that all of the ingredients, including silica, in the intermediate rubber composition of Koch Example I are encompassed by the claimed intermediate rubber layer composition through the open-ended term "including". The Board concludes at page 7 that the inner liner and intermediate rubber layer specified in claims 1 and 6 essentially differ from the corresponding layers taught in the Koch Examples in specifying the blend of halogenated butyl rubber and regular butyl rubber in the stated ratio in the composition for the inner liner layer, and in specifying the use of at least some amount of sulfenamide as the vulcanization accelerator in the composition for the intermediate rubber layer.

In this respect, it should be noted that:

- (1) claims 1 and 6 have been now amended to limit the rubber component in the inner liner layer to only "a combination of a halogenated butyl rubber and a regular butyl rubber", and the inner liner layer does not contain a diene rubber as included in the inner liner layer of Koch, and
- (2) claim 6 recites that the reinforcing ingredient included in the second rubber composition for the intermediate rubber layer is limited to "carbon black", and the rubber layer cannot include silica as incorporated into the intermediate layer of Koch.

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Thus, Applicants' claimed invention is further distinguished from Koch in that the inner liner layer does not contain any diene rubber (claims 1 and 6), and that the intermediate layer does not contain silica filler (claim 6).

As stated above, claim 6 excludes the use of silica from the intermediate layer. In contrast, Koch requires the use of at least 20 parts by weight of silica in the intermediate layer. The cited references do not provide any teaching which would motivate a person skilled in the art to remove silica from the intermediate layer of Koch. Thus, the proposed combination of cited references, particularly Koch and Exxon, cannot lead a person skilled in the art to arrive at the invention as claimed in claim 6.

(a) In this respect, the Board is of the opinion that because of the open-ended term "including", the second rubber composition in claim 6 would include any additional ingredients, such as silica (page 14, lines 3-10 of the Board Decision). However, claim 6 defines that the reinforcing ingredient included in this composition is carbon black. Accordingly, it is believed that the rubber composition for intermediate layer defined in claim 6 excludes the use of silica.

(b) The Board discusses Exxon at page 8 of the Appeal Decision with respect to accelerator systems for bromobutyl-butyl blends. The Board states that Exxon in the quoted passage would have

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disclosed to one of ordinary skill in this art that appropriate selection can be made between the more active MTBS (dibenzothiazyl disulfide) and included thiuram accelerator, and the less active sulfenamide accelerators in compounding the ingredients for the inner liner to obtain the desired result, and that Koch uses a "retarder" with mercaptobenzthiazole and tetramethyl thiuram disulfide in compounding the inner liner ingredients in Koch Example II (page 8, line 5 from the bottom to page 9, line 2).

However, these teachings of accelerator systems in Exxon and Koch are all addressed to butyl rubbers or inner liners. Exxon and Koch do not provide any teachings or suggestion about curing systems for a diene rubber layer (intermediate layer) adjacent to the inner liner containing halobutyl rubber, or about using sulfenamide accelerator with a specific amount of sulfur in the diene rubber intermediate layer. Thus, the combination of Koch and Exxon cannot lead a person skilled in the art to arrive at the invention as claimed in claims 1 and 6.

(c) The Board discusses Hous at pages 9 and 10 of the Appeal Decision. Hous discloses improving adhesion between a diene rubber carcass of composition B containing a sulfenamide accelerator and a halobutyl inner liner of composition A containing disulfide accelerator by interposing an intermediate layer of a blend of the diene rubber used in the carcass and the halobutyl rubber used in

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the inner liner. In Examples 1-3 of Hous, composition C for the intermediate layer is prepared by mixing the compositions A and B in a ratio of 1/1.

The Board states that the intermediate layer in Examples 1-3 of Hous would fall within the requirements of the intermediate layer as claimed because they contain some amount of natural rubber (diene rubber), as well as some amount of a sulfenamide accelerator. The Board further states that since Exxon discloses blends of bromobutyl rubber with butyl rubber or natural rubber (the disclosure of Hous at page 2, lines 36-38) that halobutyl in the inner liner can be blends of halobutyl(s) with unsaturated rubbers, would suggest the use of the blend of bromobutyl and regular butyl taught in Exxon. Thus, the Board concludes that one of ordinary skill in this art following the combined teachings of Hous and Exxon would have routinely arrived at the claimed pneumatic tire of claims 1 and 6.

However, the intermediate layer taught by Hous also has to contain a halobutyl rubber. Applicants' claims have now been amended to recite that the intermediate layer contains only a diene rubber as the rubber component thereof. Thus, the combined teachings of Hous and Exxon cannot lead a person skilled in the art to arrive at Applicants' claimed invention.

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Additionally, Hous does not suggest using blends of halobutyl rubber(s) with unsaturated rubbers in the inner liner layer. Hous' object is to improve the adhesion of the inner liner of a halobutyl to the carcass of an unsaturated rubber. Hous teaches that the adhesion is improved by interposing a layer of a blend of a halobutyl rubber and the unsaturated rubber (page 1, lines 5-27). If the inner liner is made of a blend of a halobutyl rubber and an unsaturated rubber, it corresponds to the intermediate layer proposed by Hous. Such an inner liner would show good adhesion to the carcass according to the teachings of Hous and there is no need to solve the adhesion problem as encountered by Hous. Indeed, it is described at page 2, lines 36-38 of Hous that "the present invention is illustrated but in no way limited by the following examples in which Compound A was a halobutyl rubber or blends of halobutyl or blends of Halobutyl(s) with unsaturated rubbers". However, only a halobutyl is used in Compound A of all of the examples. In light of the above, it is believed that Hous does not suggest using a blend of a halobutyl rubber and an unsaturated rubber in the inner liner layer. Thus, it is believed that the combined teachings of Hous and Exxon cannot lead a person skill in the art to arrive at Applicants' claimed invention in a manner as alleged by the Board.

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Accordingly, in view of the above-amendments and comments, Applicants' respectfully submit that the *prima facie* case of obviousness over the combination of Koch, Exxon, Gessler and optionally Hous, does not exist.

Taguchi III Declaration

Even assuming *arguendo*, that a *prima facie* case of obviousness existed over the combination of Koch, Exxon, Gessler and optionally Hous; Applicants respectfully submit that the experimental evidence in the enclosed Taguchi III Declaration shows the superior properties of the present rubber tire over the tire of Koch. The data from the experiments in the Taguchi III Declaration is reproduced in the following table.



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Table 3

Run No.	a	b	c	d	e	f	g	h (Koch)
<b>Rubber component</b>								
Chlorobutyl rubber	-	-	-	-	-	-	-	80
Bromobutyl rubber	65	70	80	90	95	55	100	-
Regular butyl rubber	35	30	20	10	5	45	-	-
Natural rubber	-	-	-	-	-	-	-	20
<b>Hardness (JIS A hardness)</b>								
Unaged	50	51	53	58	57	48	58	62
Aged 110°C 50 hours	51	52	55	58	59	48	61	65
Aged 110°C 100 hours	51	54	56	60	62	49	63	68
Aged 110°C 150 hours	52	55	58	62	64	49	66	71
<b>De mattia cut growth</b>								
Unaged	40x10 <sup>6</sup>	>40x10 <sup>6</sup>	>40x10 <sup>6</sup>	23x10 <sup>6</sup>	15x10 <sup>6</sup>	40x10 <sup>6</sup>	5x10 <sup>6</sup>	5x10 <sup>5</sup>
Aged 110°C 150 hours	14x10 <sup>6</sup>	11x10 <sup>6</sup>	7x10 <sup>6</sup>	2.3x10 <sup>6</sup>	1.4x10 <sup>6</sup>	16x10 <sup>6</sup>	0.2x10 <sup>6</sup>	0.05x10 <sup>6</sup>

According to present claim 1, the rubber composition consists of 60 to 95% by weight of halogenated butyl rubber and 5 to 40% by weight of regular butyl rubber. In the above-table, Runs a-f are the inventive examples and Runs g-h are comparative examples. Run g is a rubber composition falling outside of the presently claimed composition, since the bromobutyl rubber was used alone with no other rubber component. Run h corresponds to Example 2 of Koch et al.

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With regard to Run h, the De mattia cut growth of the rubber composition for the unaged rubber was  $5 \times 10^6$ . Based upon the unique features of the present composition, the De mattia cut growth for the unaged composition showed a minimum improvement of at least 300% and for the aged composition, the minimum improvement was 2,800%, see Run e.

A similar magnitude of improvement can be found upon comparing the comparative Run g to the inventive Run e for De mattia cut growth.

From the above table, it would be understood by the skilled artisan that the inner liner according to the present invention has an excellent crack-growth resistance when compared to the inner liner prepared from a blend of chlorobutyl rubber and natural rubber according to Koch et al.

Furthermore, the increase in hardness of the inner liner according to the present invention by heat aging is smaller than that of the inner liner according to Koch et al.

Based on the above-findings, Mr. Takaguchi concludes that the inner liner according to the present invention has a higher aging resistance or durability than the inner liner prepared according to Koch et al.

Since the improvement of the present rubber composition are of such a magnitude as to be a difference in kind rather than one of

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merely degree, the present rubber composition would not be made obvious based on the teachings of Koch et al. Thus, even if a *prima facie* case of obviousness were said to exist over the combination of Koch, Exxon, Gessler and optionally Hous (even though it does not), the experimental evidence in the Taguchi III Declaration overcome the *prima facie* case of obviousness.

With respect to rejection (2), i.e., the 103(a) rejection of claims 1-7 over Koch taken with Berta '686 and Berta '302, Applicants attempted to remove this rejection during prosecution of the parent application by including the transitional phrase "consisting essentially of" in the application claims and presenting a showing (Taguchi I Declaration, filed February 20, 1996) that the epihalohydrin rubber and/or a chlorinated isoprene rubber required by the Berta references materially affects the properties of the tire rubber composition. The Board did not find Applicants' arguments/evidence persuasive and took the position that:

- (i) the combined teachings of Koch, Berta '686 and Berta '302, *prima facie* suggest that compounding composition for an inner liner in Koch Example II can be modified by replacing the blend of natural rubber and chlorobutyl rubber with a mixture of halobutyl,

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regular butyl and an epihalohydrin rubber and/or a chlorinated isoprene rubber as suggested by the Berta references (Decision on Appeal, page 19, lines 1-7), and

- (ii) Taguchi I Declaration is not adequate to show that the presence of epihalohydrin rubber or chlorinated isoprene rubber adversely affect the basic and novel characteristics of the inner layer as claimed (Decision, page 19, line 8 to page 21, line 14).

However, claims 1 and 6 have now been amended to change "consisting essentially of" to --consisting of--. Thus, epihalohydrin rubber and chlorinated isoprene rubber are no longer encompassed by the claimed composition. The modified composition according to Koch and Berta references does not fall within claims 1, 6 and 8.

Applicants respectfully submit that the combination of Koch, Berta '686 and Berta '302 do not make the present claims obvious, since the combination of Koch, Berta '686 and Berta '302 do not teach that the epihalohydrin rubber and the chlorinated isoprene rubber are merely optional components. These components are required by the teachings of the references. Accordingly, a *prima facie* case of obviousness over this combination of references no longer exists.

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Conclusion

Based upon the above amendments and comments, Applicants respectfully submit that the claims are in condition for allowance. A notice to such effect is earnestly solicited.

Attached hereto is a marked-up version of the changes made to the application by this Amendment.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Garth M. Dahlen, Ph.D. (Reg. 43,575) at the telephone number of the undersigned below.

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If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH &amp; BIRCH, LLP

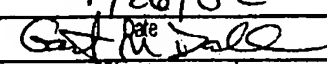
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Attachments: 1) Marked Up Copy of Claims Showing Changes Made  
2) Taguchi III Declaration

(Rev. 12/19/01)

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VERSION WITH MARKINGS TO SHOW CHANGES MADEIN THE CLAIMS:

The claims have been amended as follows:

1. (Amended) A pneumatic tire having a carcass of at least one layer, said carcass having a pair of ends engaged with a pair of bead cores on both sides with each of the ends being turned up outwardly from an inner side around each of the pair of bead cores, an inner liner made of a first rubber composition disposed radially inside of the carcass, and a rubber layer disposed between said carcass and said inner liner;

the rubber component of said first rubber composition consisting [essentially] of 60 to 95% by weight of a halogenated butyl rubber and 5 to 40% by weight of a regular butyl rubber, said regular butyl rubber being an isobutylene-isoprene copolymer rubber, and

said rubber layer being made of a second rubber composition including a rubber component consisting of a diene rubber, sulfur and a sulfenamide vulcanization accelerator;

the amount of sulfur of said second rubber composition being represented by the equation (I):

$$2 + 0.05A \leq x \leq 5 + 0.05A \quad (I)$$

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wherein X is the amount of sulfur in parts per hundred of the diene rubber of said rubber layer and A is the percentage by weight of the regular butyl rubber in the rubber component of said first rubber composition.

6. (Amended) A pneumatic tire having a carcass of at least one layer, said carcass having a pair of ends engaged with a pair of bead cores on both sides with each of the ends being turned up outwardly from an inner side around each of the pair of bead cores, an inner liner made of a first rubber composition disposed radially inside of the carcass, and a rubber layer disposed between said carcass and said inner liner;

the rubber component of said first rubber composition consisting [essentially] of 60 to 95% by weight of a halogenated butyl rubber and 5 to 40% by weight of a regular butyl rubber, said regular butyl rubber being an isobutylene-isoprene copolymer rubber, and

said rubber layer being made of a second rubber composition including a rubber component consisting of a diene rubber, sulfur, a sulfenamide vulcanization accelerator and a reinforcing ingredient, said reinforcing ingredient being carbon black;

the amount of sulfur of said second rubber composition being represented by the equation (I):



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$$2 + 0.05A [\leq] x [\leq] 5 + 0.05A \quad (I)$$

wherein X is the amount of sulfur in parts per hundred of the diene rubber of said rubber layer and A is the percentage by weight of the regular butyl rubber in the rubber component of said first rubber composition.